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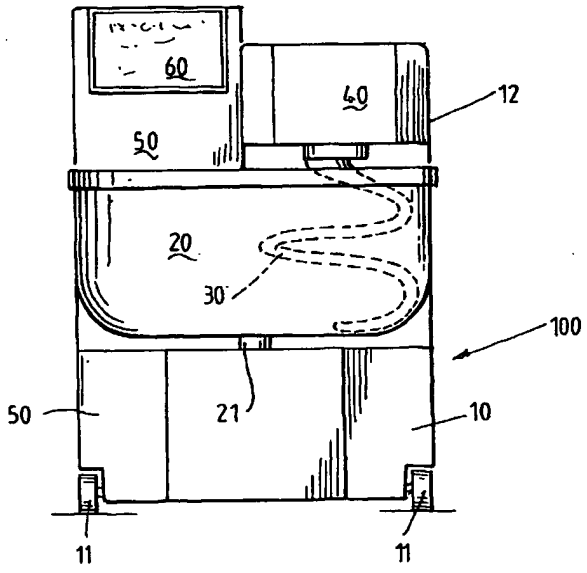
For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: IMPROVEMENTS IN DOUGH MIXERS



(57) Abstract: Dough mixer (100) includes a computer program for controlling mixer (100) such that the temperature of formed dough is regulated. Mixer (100) further includes water tank (50) having elements that regulate water temperature. Tank (50) is linked to control system (60) for dispensing a predetermined volume of water at a predetermined temperature and flow rate. Control system (60) includes a computer program that calculates the predetermined temperature, volume and flow rate of water in response to certain input information, such as the temperature of the raw dough ingredients, the bakery air temperature and the typical temperature rise of a dough during formation. Mixer (100) and the computer program are claimed separately.

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Improvements in dough mixers

Field of the invention

This invention relates to improvements in dough mixers. The invention particularly relates, but is not limited, to improvements in "spiral beater" or "rams horn" dough mixers.

Background of the invention

The machine commonly known in the bakery industry as the "spiral" dough mixer is called that because of the helical beater, generally referred to as a "spiral" beater, used to mix the ingredients. Such mixers can be manufactured to use many different sizes and shapes of mixing bowl and spiral beater. Spiral beater dough mixers have gained acceptance in the baking industry due to the superior mixing of a spiral beater when the mixing bowl rotates. To accommodate different types of doughs, it is possible to rotate the spiral beater at different speeds, and rotate the bowl in different directions.

It is generally accepted that dough temperature should be between 28°C and 30°C at completion of mixing. The temperature of water added to the dough ingredients during dough formation is therefore critical in determining the final dough temperature. The mixing action creates friction in the dough and thus causes the dough temperature to rise.

The dough temperature at completion of mixing can be controlled by adding cold water to oppose the heat rise due to the friction in the dough. Such cold water is typically provided in bakeries by adding ice to an existing tank of water stored at ambient temperature, or storing containers in bakery cold rooms.

While chilling machines are common in many forms, the growing requirement for less wasted space in bakeries requires most chillers to be wall mounted above or in close proximity to the mixer. Wall mounting may be convenient for space, but the areas higher up in bakeries tend to be warmer, making for poor efficiency of the chiller. Service of the chiller is also difficult and, because vermin can dwell inside the system, there are health and hygiene implications when such systems are fitted flush, or close to the walls.

It is therefore an objective of the present invention to improve control of dough temperature.

Summary of the invention

In one aspect, the invention provides a dough mixer including:

a frame;

means, mounted on the frame, for supporting a mixing bowl;

means, mounted on the frame, for driving a mixing element to mix ingredients in a mixing bowl, whereby to form dough; and

a reservoir operable to dispense water into a mixing bowl whereby to regulate the temperature of formed dough.

The reservoir and control means are preferably mounted on the frame adjacent the driving means such that they do not extend beyond the external dimensions of the frame.

A pump means may be used to pump the water from the reservoir into a mixing bowl at a desired flow rate. Alternatively, the water may be gravity fed.

In the preferred embodiment, the mixing bowl support means is operable to rotate the mixing bowl relative to the frame to enhance mixing of the ingredients and formation of the dough.

Preferably, the control means further controls the drive means and rotation of the mixing bowl via the support means.

To further improve temperature regulation of the dough, the reservoir may include temperature regulating means for cooling or heating contents of the reservoir. The reservoir, in a preferred embodiment, is linked to a control means which controls the regulating means and volume and flow rate of water dispensed from the reservoir to dispense a predetermined volume of water at a predetermined temperature and/or flow rate.

The control means is preferably programmable to dispense a predetermined volume of water at a predetermined water temperature and/or flow rate. Moreover, the control means may be programmable by a computer program that accounts for dough type, mixing bowl size and/or dough size to calculate the predetermined water volume, flow rate and temperature for dispensing.

Brief description of the drawings

To enable the invention to be fully understood, a preferred embodiment will now be described with reference to the accompanying drawings, in which:

FIG. 1 is a front elevational view of a spiral beater dough mixer in accordance with the present invention;

FIG. 2 is top plan view corresponding to FIG. 1; and

FIG. 3 is a flow chart of the operation of a computer program for calculating the predetermined water volume and temperature.

Description of the preferred embodiment

A mixer 100 is provided with a wheeled frame 10 that enables the mixer to be easily located in a bakery and is substantially formed in a C-shape when viewed from the side.

A mixing bowl 20 is mounted on a support means including a drive shaft 21 connected to a drive motor (not shown) that is mounted on the frame 10. The mixing bowl drive motor is connected to a control system 60 that controls the speed of rotation and/or direction of rotation of the mixing bowl relative to the frame to be selectively set or adjusted.

A mixing element in the form of a helical "rams horn" beater 30 is operably connected to driving means comprising a beater drive motor 40 mounted in an upper portion 12 of the frame 10. It will be noted that the axis of rotation of the beater 30 is offset relative to the axis of rotation of the mixer bowl 20 such that the beater 30 rotates closely to the side of the mixer bowl 20.

In an alternative embodiment, mixing bowl 20 has a raised "hub" in the centre or a kneading bar, depending on the manufacturer and/or type of dough to be mixed.

The mixer 100, is typical of mixers already existing in the bakery industry.

In contrast to typical mixers, a reservoir is provided in the mixer 100 in the form of a water tank 50 mounted on the frame 11, rearwardly of the mixer bowl 20, such that it remains within the width and depth dimension of the frame 10. It

should be noted that the width dimension of the frame 10 substantially corresponds to the diameter of the mixer bowl 20.

The water storage tank 50 is provided with chilling and heater elements for regulating the temperature of the water in the tank. A compressor system, a pressure pump, valve and switch gear, litre counter, hosing, overflow water level control and/or water supply inlet (not shown), are also provided and in combination with the temperature regulating element controls, to enable water, at predetermined temperature and volumes to be supplied to the mixing bowl 20 at a predetermined flow rate.

A control system 60 controls the mixing bowl 20, drive motor, beater drive motor 40, water temperature, regulating elements, volume and flow rate and volume controls and is provided on the frame 10 at a level spaced above the level of the mixer bowl 20. The control system 60 incorporates a computer program that can be used to program the control system 60 via inputting information. The flow chart in Figure 3 illustrates the operation of the computer program..

In response to the of dough type selected 110, the computer program retrieves from a database 120 an ingredients list 130 for the selected dough type and a known typical dough temperature rise during dough formation for given mixing times, dough types and dough volumes. The user then inputs the dough size, ingredient temperatures and the ambient temperature of the bakery 140. The computer program utilises the input information, in combination with known typical dough temperature rise, thereby to calculate a predetermined water temperature, volume and flow rate to be supplied from the water tank 50 to the mixing bowl 20 which will ensure that the dough temperature, at completion of mixing, will be between 28°C and 30°C. The predetermined water temperature, volume and flow rate are then programmed into the control system 60 to facilitate the dough

formation process such that the final dough temperature will be within the desired range of temperatures.

The mixer 100, beneficially, will be less expensive to build as a single integrated control system 60 operates both the mixing bowl 20, beater 30 and chilling and heating elements.

Furthermore, having the mixer 100 formed from a single frame and which includes the water tank 50 is easier to build and easier to install in the customer's premises, along with being easier to access for servicing, as the mixer is on wheels.

"Batching" of dough types makes for a more user-friendly mixer 100, as the control system 60 and incorporated computer program will avoid mistakes by limiting water to flour volume used. A reminder button is also included on the control system 60 for yeast and other ingredients to help avoid mistakes by reminding the operator to put in each ingredient at the required volume. Moreover, the machine will not start unless confirmation buttons have been pressed.

Various changes and modifications may be made to the embodiments described and illustrated without departing from the present invention.

CLAIMS:

1. A dough mixer including:

a frame;

means, mounted on the frame, for supporting a mixing bowl;

means, mounted on the frame, for driving a mixing element to mix ingredients in a mixing bowl, whereby to form dough; and

a reservoir operable to dispense water into a mixing bowl whereby to regulate the temperature of formed dough.

2. A dough mixer according to claim 1, wherein the reservoir includes means for regulating the temperature of the contents of the reservoir.

3. A dough mixer according to claim 2, wherein the reservoir is operably linked to a control means which controls the regulating means and volume and flow rate of water to be dispensed.

4. A dough mixer according to claim 3, wherein the control means is programmable to dispense a predetermined volume of water at a predetermined water temperature and/or flow rate from the reservoir.

5. A dough mixer according to claim 4, wherein the control means is programmable by a computer program that accounts for mixing bowl and/or dough size and dough type to calculate the predetermined water volume, flow rate and temperature for dispensing from the reservoir.

6. A dough mixer according to claim 5, wherein the reservoir and control means are mounted on the frame such that they do not extend beyond the external dimensions of the frame.

7. A dough mixer according to claim 6, wherein the reservoir and control means are mounted on the frame adjacent the driving means.

8. A dough mixer according to claim 7, wherein the dough mixer further includes a pump controllably linked to the control means to pump water from the reservoir into a mixing bowl.

9. A dough mixer according to any one of the preceding claims, wherein the mixing bowl support means is operable to rotate a mixing bowl supported thereon relative to the frame to enhance mixing of the ingredients and formation of the dough.

10. A computer program for regulating the temperature of dough formed in a dough mixer, the computer program being capable of performing the step of calculating a predetermined water volume and temperature to control the temperature of the dough being mixed in a mixer in response to input information.

11. A computer program according to claim 10, wherein the step of calculating the predetermined water volume and temperature includes the steps of:

receiving input information about the dough type, ambient bakery air temperature and the temperature of the dough ingredients; and

retrieving, from a database, information concerning the ingredients from which the dough is to be formed and temperature rise of said dough type during dough formation.

12. A computer program according to claim 10 or 11, wherein the computer program is in machine readable form.

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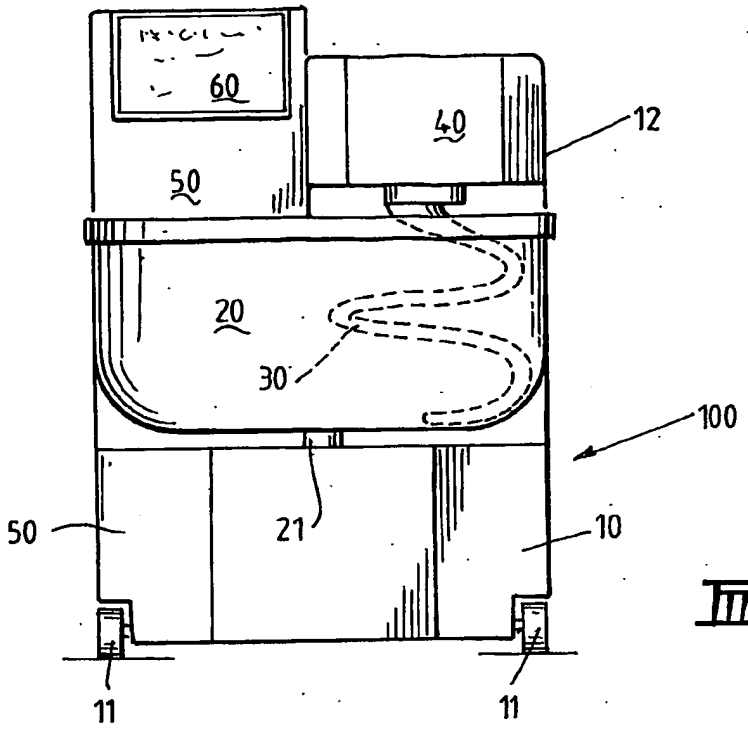

FIG. 1.

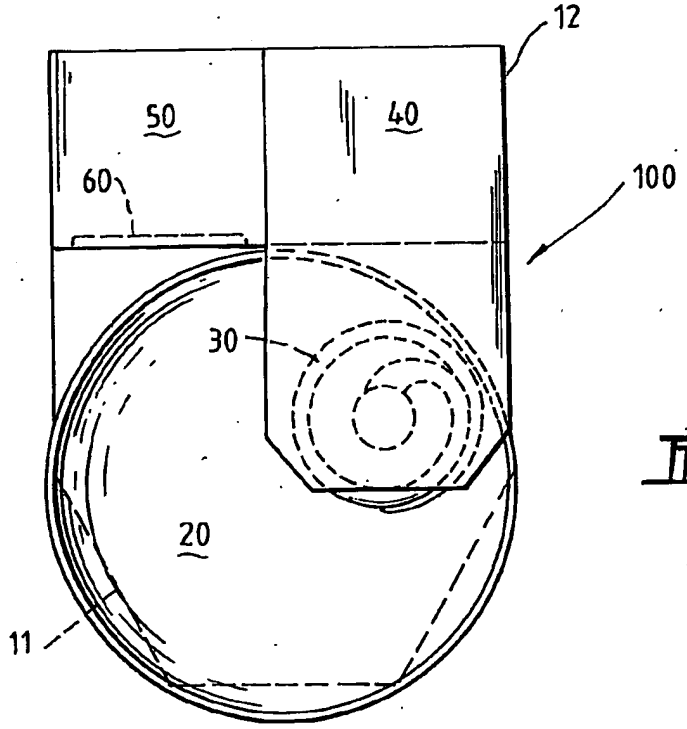

FIG. 2.

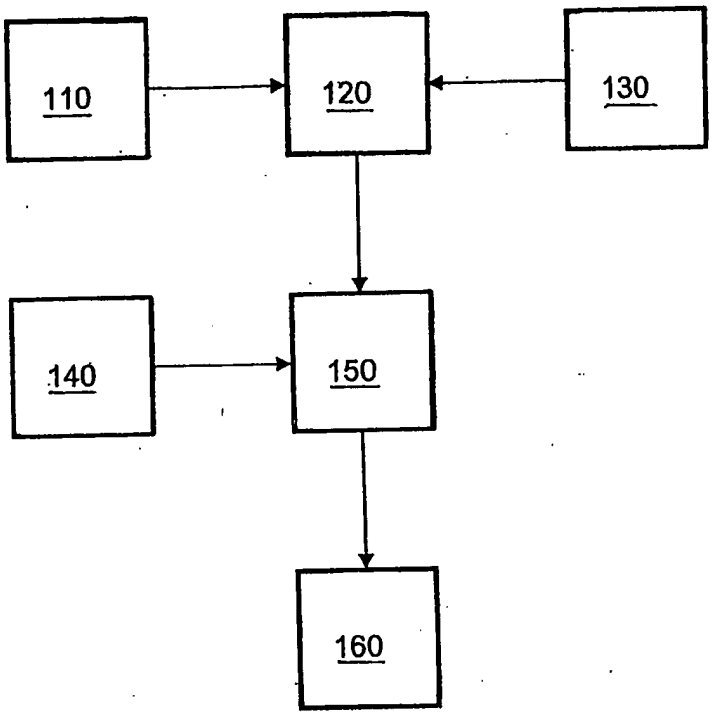

FIG. 3.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU03/00975

A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl. [7]: A21C 1/02; A21D 8/02; G06F 19/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

AU: IPC A21C 1/02; A21D 8/02; G06F 19/00

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

DWPI: IPC A21C 1/-, A21D 8/-, G06F 19/- and keywords such as dough, regulate, temperature and similar terms.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
	JP 63-264028 A (SEIBU DENKI KOGYO KK) 31 October 1988	
X	Whole document (& Derwent Abstract Accession No. 88-351052/49)	1-12
Y	Whole document (& Derwent Abstract Accession No. 88-351052/49)	1-12
	FR 2723819 A (RONDEAUX) 1 March 1996	
X	Whole document	10-12
Y	Whole document	1-12
	FR 2676619 A (LECLERC) 27 November 1992	
X	Whole document	10-12
Y	Whole document	1-12

[X] Further documents are listed in the continuation of Box C [X] See patent family annex

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search
1 September 2003

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU03/00975

C (Continuation). **DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
	US 4766766 A (AHLERT et al) 30 August 1988	
X	Whole document	10-12
Y	Whole document	1-12
	DE 3521727 A (MENGE) 18 December 1986	
X	Whole document	10-12
Y	Whole document	1-12
	FR 2514170 A (MISIA SRL) 8 April 1983	
X	Whole document	10-12
Y	Whole document	1-12
	NOTE: For the 'Y' indications, JP 63-264028 can be combined with any other document for the claims indicated.	

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.
PCT/AU03/00975

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report		Patent Family Member			
JP	63-264028	NONE			
FR	2723819	NONE			
FR	2676619	NONE			
US	4766766	DE	3504860	EP	191288
DE	3521727	NONE			
FR	2514170	DE	3236451	IT	1139186

END OF ANNEX